Space Weather Technical Forecast

Issued on Saturday, 19 August 2023 at 01:09 Local

This technical forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Chance of isolated M-class flares and R1 Radio Blackouts throughout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity measured by GOES16 has remained Low through the UTC day of Friday 18 August, with isolated C-class flares peaking with a C3.7 at 18/1930UTC from AR3408 in the northwestern quadrant. A second C3.0 emanated from the same region at 18/2135UTC. The larger event was tied to a Coronal Mass Ejection (CME) - ejecting an adjecent filament that has yet to be analysed - but may carry an Earth-directed component given its emission location. X-ray activity was otherwise lower than in recent days, with background flux now in high B-class.

There are currently up to ten sunspot regions on the visible disc, with a new region possibly becoming visible near the southeast limb. All of the current front-sided active regions were either stable or in decay, with the exception of the peak flare-producing AR3408 and the small AR3410, with both lying near 40W. AR3408, a Dro/Beta, saw overall areal decay, some consolidation and a reduction in spot count, however its intermediate spots were relatively dynamic and mobile for a time. AR3410 saw areal growth of its leader and some small trailer spots develop, but finished the period as fading Hsx/Alpha.

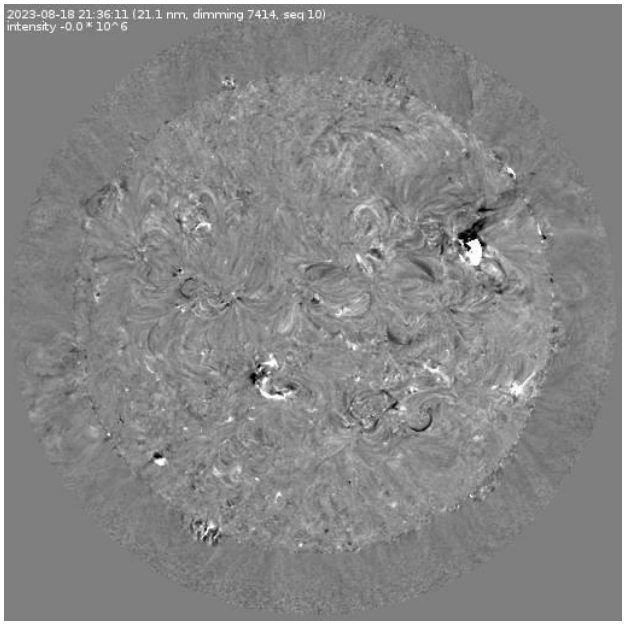


Figure 0: SIDC ROB time-integrated AIA 211 dimming showing possible CME emanating from the C3.7 flare from AR3408 at 18/1930UTC (upper right). This has yet to be analsyed pending coronagraph imagery, but may carry an Earth-directed component.

The aforementioned peak flare produced a CME that has yet to be analysed. No other

© Crown Copyright 2023. All Rights Reserved.

potentially Earth-directed CMEs were detected in available imagery, with other coronagraph ejecta tentatively mainly associated with the far-sided western solar hemisphere.

Solar Wind / Geomagnetic Activity: The solar wind, as measured by ACE at L1, suggests Earth is transiting a sector of space characterised by a negative polarity fast wind as of 18/0200UTC, with this preceded by a CIR and thought to be related to CH35/-. The phi angle was accordingly negative throughout (towards the Sun).

Solar wind speeds rose from Background levels near 325km/s, making step-wise increases in the fast wind regime to peak near a Slightly Elevated 475km/s after 18/0730UTC. The solar wind density started the period near 10ppcc in the CIR, subsequently declining into single figures ppcc as the UTC day continued. The IMF peaked at 15nT at the fast wind's onset, moderating to around 7nT by the period's end. The north-south component was volatile within this envelope, ranging from +/-12nT but not spending protracted periods either co- or anti-aligned with Earth's field.

The net result of the above solar wind measures was for provisionally Quiet to Unsettled geomagnetic activity, peaking with a Kp '3+' in the 09-12UTC interval.

Energetic Particles / Solar Radiation: GOES16 high energy (greater than 10MeV) proton flux remained at Background. levels.

GOES16 high energy (greater than 2MeV) electron flux persisted at Normal Background levels, with the associated 24-hour fluence well below the Active level, with an observed value of 1.49e6 integrated pfu at 19/0001UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Activity is most likely to remain Low, but perhaps show an uptick with the arrival of some far-sided groups with potent last-day statuses into the new UTC week.

Solar Wind / Geomagnetic Activity: No Earth-directed CMEs feature in the forecast, and the sole fast wind is the incumbent CH35/-. This fast wind has now likely peaked, and the chances of occasional Unsettled intervals should fade later in the UTC weekend to leave a largely Quiet remainder of the forecast into the new UTC working week.

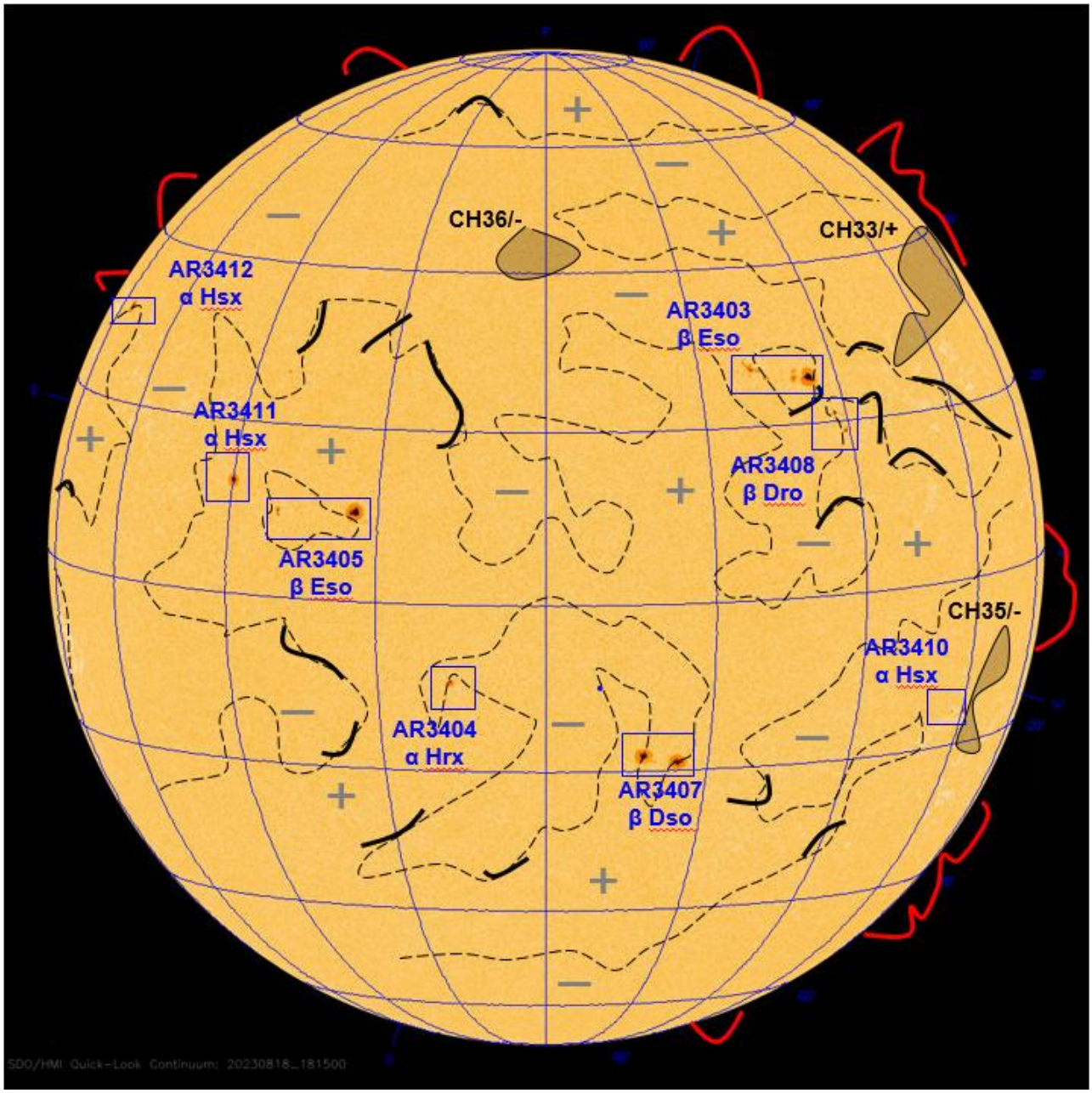
Energetic Particles / Solar Radiation: High energy (greater than 10 MeV) proton flux is expected to remain at Background levels.

High energy electron flux (greater than 2MeV) may show a slight increase as CH35/- wanes, with diurnal peaks in Moderate becoming more likely later in the UTC weekend. The associated 24-hour fluence is expected to persist comfortably below Active (1e8 integrated pfu).

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2023. All Rights Reserved.

Figure 1. Solar Analysis Valid 18/1815UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2023. All Rights Reserved.

Geomagnetic Storms:

No Earth-directed CMEs feature in the forecast, however there is at least one candidate awaiting imagery for assessment from the northwestern quadrant.

Otherwise, the sole fast wind is the incumbent CH35/-. This fast wind has now likely peaked, and the chances of occasional Unsettled intervals should fade later in the UTC weekend to leave a largely Quiet remainder of the forecast into the new UTC working week.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

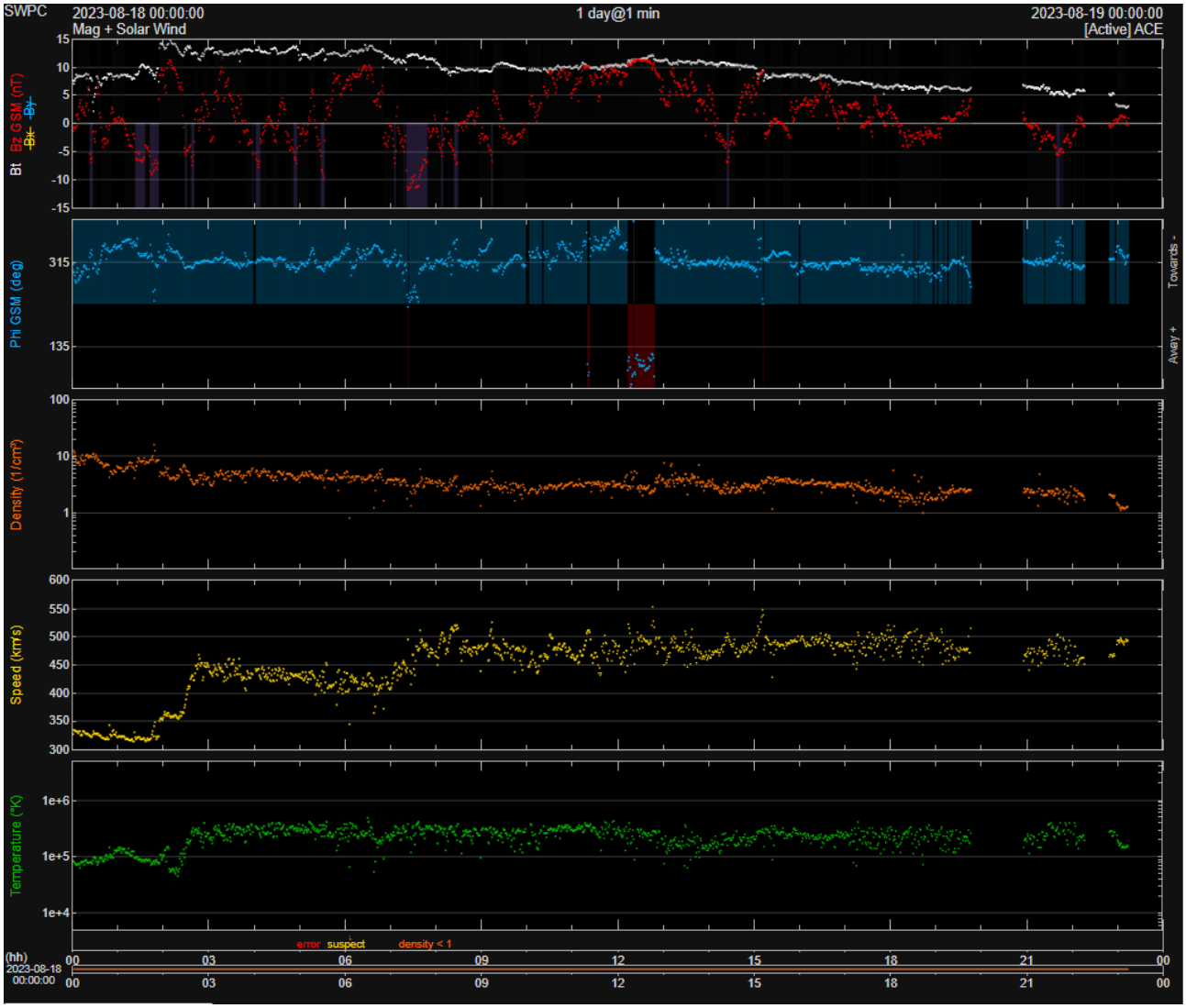
Geomagnetic Activity - Earthbound Coronal Mass Ejections

Nil, but note one CME candidate pending analysis.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2023. All Rights Reserved.

Figure 2: NOAA SWPC visualisation for L1 solar wind conditions for the UTC day of Friday 18 August, showing a CIR into a negative polarity fast wind – likely that from CH35/-.



Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2023. All Rights Reserved.

Radio Blackouts - X-Ray Flares:

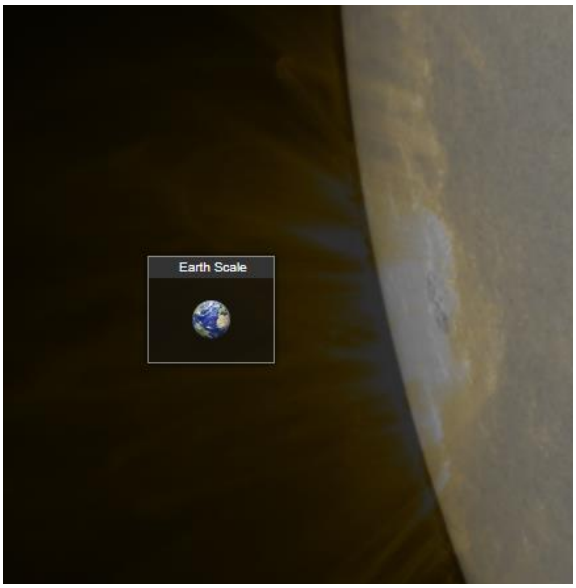
Solar activity has remained Low over the UTC day of Friday 18 August, with the 10.7cm flux falling to 150sfu from a midweek high of 160, although there are signs that this falling trend has now greatly slowed.

While there remain some nominally complex regions on the Earth-facing disc, most of these are now mature and either stable or in decay, with those bucking this trend generally being the smaller occupants of the disc in AR3408 and AR3410. AR3408, in particular, has shown a good deal of movement in its intermediate spots, and is perhaps one to watch for development considering its late contribution to C-class activity in the reporting period.

The eastern solar horizon will shortly reveal the Carrington location for the previously active Ex-3386 of roughly a fortnight ago, and is perhaps already showing a returning feature that may respond to Ex-3380 on the southeastern limb. While neither is guaranteed to show its former activity, given the quiet frontside, these additions are considered likely to increase the risk of M-class flares, and far-side soundings hint that they (or at least the plages they inhabit) remain in place.

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**R1-R2 M Class**	No	25	30	30	30
Very Active	**R3 to R5 X Class**	No	1	1	1	1

Figure 3: Arriving unnumbered active region over the southeastern solar horizon, Helioviewer.org-generated AIA171 and HMIIF composite as at 18/2300UTC. This is possibly the returning Ex-AR3380 which was an Eac/Beta-Gamma-Delta for a time on its last front side appearance.



Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2023. All Rights Reserved.

Solar Radiation Storms - (High Energy Protons):

High energy (greater than 10MeV) proton flux observed by GOES16 is expected to remain at Background levels.

There persists an ongoing and very gradually increasing Slight Chance of proton flux increases from any significant flares, perhaps most likely from the western solar hemisphere, however these are considered unlikely to reach S1 Minor Solar Radiation Storm levels.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	2	2	5	5
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

The high energy (greater than 2 MeV) electron flux is at Normal Background levels. A degree of recovery in flux at GEO is expected later in the current UTC weekend as the fast wind from CH35/- wanes, however the limited strength of the current enhancement along with persistence and the latest MOSWOC REFM forecast all suggest that this will prove insufficient to generated Active 24-hour integrated fluence.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	5	5	5
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2023. All Rights Reserved.